

Professional Examinations as Entry Barriers

Shea Parkes

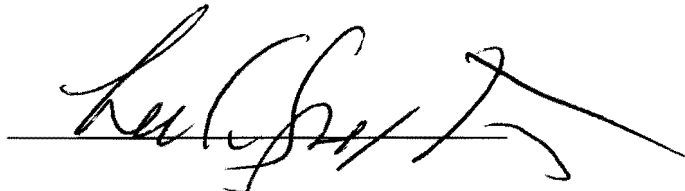
Professional Examinations as Entry Barriers

An Honors Thesis (HONRS 499)

By

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A handwritten signature in black ink, appearing to read 'Lee Spector', is written over a horizontal line.

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I. Abstract

Many professions require successfully completing examinations before allowing individuals to practice. These examinations are often administrated by organizations consisting of individuals currently practicing that profession. Some examples of these organizations are the American Bar Association, the Society of Actuaries and the American Institute of Certified Public Accountants. The public motive behind these examinations is to maintain a high level of competence in order to ensure public confidence. A possible alternative explanation for these examinations is that they erect an entrance barrier which leads to higher incomes for those already practicing these professions. In this paper, I am first going to compare the details and stated purposes of each of these examinations. Next, I am going to study the effects these examinations have on the supply of labor, income levels and other available economic data. Finally, I will examine how such economic variables are affected by the differential structures of these entrance examinations.

II. Introduction

A. Reasons for Professional Regulation

Civilizations have advanced greatly over the recent 50 centuries. When humanity started, we had to spend every waking minute scraping for food and shelter with our primitive stone tools. Over the years, we have gotten much better at surviving; many would say we have even come to flourish. These days, most people in the United States have absolutely no hand in the production of food. Today our tools are so miraculous; most people cannot fully understand them. Many people know how to use a personal computer, but only the smallest portion of our population could actually build one. This illustrates one of the key tools of advancement for civilization: specialization.

One single person may be able to live off the land, but he would never be able to have the amount of leisure time or enjoyable amenities that we have today. This is because one person cannot be exceptional at doing everything himself. It is also true that he would not have access to all the wonderful technology we have now, and even if he did have access, it is unlikely he would know how to use it all. We gain our leisure time because everyone in society specializes to produce society's needs.

It is easy to see how specialization began by looking at an early profession such as a blacksmith. The jobs a village blacksmith would perform would be very difficult if not impossible for another member of the village to replicate. Therefore, the other villagers would be willing to trade for the blacksmith's services. A blacksmith would gladly accept an exchange of some kind to satisfy his basic needs. If the blacksmith never has to worry about producing his

own food and can spend all of his time working with metal, then he will just continue to become better and more proficient. This is a very mutually beneficial relationship.

In modern days we do not have many blacksmiths, but we do still have a great deal of specialization. In fact, it is astounding the numbers of professions a young person could enter into today. My research is focused on three of these professions: actuaries, lawyers and accountants. Lawyers and accountants are common enough for most people to grasp what services they provide. Actuaries are less well known. Basically, they are mathematicians who price insurance. Actuaries often prefer to be known as strong businesspeople with the ability to numerically evaluate risk.

These professions can be compared to the blacksmith example. All four of these jobs, actuaries, lawyers, accountants and blacksmiths, came from a rather advanced application of specialization. It takes advanced study and understanding to be able to perform the services all of these professions provide. It is not easy to work metal, price insurance, understand and apply laws, or to keep a precise measurement of the movement of money. However, it is quite a different matter to be able to tell if one of these professionals did their job correctly. Let us look at each of the mentioned professions individually with regard to customer satisfaction and how it holds the professionals responsible.

The village blacksmith was generally a well known person in the community. Oftentimes, he was also well respected, but that depended on his quality of work. When a farmer purchased a plow blade from the blacksmith, he would not immediately know the quality of the plow. As the farmer used the plow blade though, he would be able to make a very accurate judgment of the plow blade. If the work on the blade was poor, it would quickly dull or snap and leave a very unhappy farmer. The farmer would then go back to the same blacksmith and

demand compensation of some manner, or at the very least, he would offer the blacksmith much less money for his next plow blade. Then in addition to confronting the blacksmith, he would quickly tell his plight to all the other villagers. The other villagers might dismiss one or two bad plow blades, but if multiple villagers had problems, then the blacksmith would very quickly lose credibility.

This logical chain of events keeps the blacksmith on a straight and narrow path. He must produce quality products and charge reasonable prices, otherwise the villagers would become unsatisfied and it would become easy for another blacksmith to move in and take over his business. There are a few key links in this chain that binds our blacksmith though. First, it was possible for the farmer to know that he received a bad plow blade. For example, if all the villagers inside one town have only ever purchased plow blades from the same blacksmith, they may not be able to tell a good plow blade from a bad plow blade. If any of the villagers had ever lived elsewhere though, the fraudulent blacksmith would quickly be exposed.

Another, more important, way this may occur would be if a villager purchased a product completely new to him. If so, then he does not know what to look for as far as quality in this new product. A villager who purchased a poor sword is a perfect example of an uninformed consumer. It is quite likely that the blacksmith knew it was a poor sword, but he might have felt no remorse in selling it to the villager. From the blacksmith's point of view he knows that the peaceful villager would pay the same price for a quality weapon as he would for a poor replica. The blacksmith also realized it would take much less of his time to throw together the cheap sword, so he would be making a much larger profit. It may be pointed out that the blacksmith should have a moral obligation to provide a quality sword, after all, what if the villager needed it? However, it is quite possible that the blacksmith knows the villager never plans on using the

sword. The blacksmith probably just sees the peaceful villager as paying for peace of mind instead of for true physical protection.

A modern day equivalent could be a lawyer writing a will. There is a fine art to writing a will to make sure that each of your descendent receives the proportion of wealth that you desire them to. Your average citizen could not write a good will, nor could he tell if a will he purchased is legally solid either. He has to put his trust into a lawyer to translate his true desires into writing.

In parallel to the poorly wrought sword though, how easy is it to recognize a poorly written will? Very seldom is a will ever contested or scrutinized over by common citizens. It is often just purchased, drafted, and then placed in some obscure security deposit box. Even on the rare occurrence when an elderly parent passes away and the remaining children squabble in court over the estate, the lawyer who wrote the will is likely long passed away as well. An old lawyer does not need to worry much about the repercussions of his actions, especially since his customer is deceased. A professional examination given to the old lawyer at the beginning of his career might have very little impact on his actions at the end of his career, especially if the examination only tested his knowledge of the law. Many of the examinations now also have a large section on moral obligation. They try to instill a sense of integrity into the young professionals. The squabbling children who suffer from the bad will might become capable of distinguishing a good will from a bad will, but it is not really a skill to pass on to their children or to discuss at the coffee shop. So in regards to purchasing wills, most of the customers are going to be uninformed.

In fact, most citizens do not discuss their satisfaction with any professional services when they are in casual conversation with their friends. In the days of a village blacksmith, the

whole town would quickly know after the blacksmith produced many faulty products. For a lawyer in a big city though, he does not have to worry about word of mouth, and very little of his business even comes from word of mouth. This is related to the other fact that most of these professionals work on one time business. It might be common to visit a tax accountant every year, but many people just use financial advisors as one time consultants to plan their lives all the way through retirement. Lawyers in particular do not generally help people draft more than one will or settle more than one divorce case.

All of these reasons contribute to the need to regulate these professions. The village blacksmith was kept in check and held accountable for his actions without any government intervention. These highly educated professionals of today do not have the same inherent constraints built into them. Therefore, governments often step in and perform some sort of regulation on these professions. Or sometimes the professions regulate themselves so that they can keep up a reputable image with the public and their potential customers.

B. Problems with Professional Regulation

Although the above arguments for professional examinations seem logical, many of them do not hold up under closer scrutiny. The biggest assumption from above might be that all modern consumers are uninformed about a lot of the products they are purchasing. While it is true that there is so much specialization today, it is not impossible for a consumer to still learn about a product before he purchases it. There are plenty of magazines like *Consumer Guide* or an even larger abundance of information available over the internet. Another flaw in the uninformed consumer argument is just who the consumers are. When an insurance policy is purchased, the money does not go straight to the actuary; it goes through the insurance company first. When focus is placed on the labor market, it is easy to see that the real consumers for these professionals are the companies that hire them, not the public that purchases their products. These companies are always extremely knowledgeable about what they want too. They are not uninformed about qualities to look for in a professional. In reality, there really are not many uninformed consumers for professional examinations to protect.

Even in the few cases where there is an uninformed consumer, such as a small town independent lawyer writing a will, the examinations have no way of protecting the consumer. These professionals only have to pass the entry examinations once when they begin. The examinations provide no incentive for a practicing professional to stay current on his knowledge base. He has already passed the examination and views his time spent on it as a sunk cost, it is over and done with. The examinations can try to instill a moral obligation to perform credible work, but it is still the individual professional that has to follow through with it. For an elder professional close to retirement, the often forgotten examinations provide no real incentive to

churn out quality work anymore. The examinations really do not work well at protecting the consumers. The reasons given could be seen as rationalizations.

Even accepting that there are questionable reasons for professional regulation, as soon as regulation takes place other problems arise. The most problems seem to appear when professionals are regulated by themselves for their own private interests. Private interests are really the driving force of most the problems professional regulations face. It can be assumed that most individuals are driven to maximize their wealth. One way for them to acquire more stuff would be to make more money than everyone else is making. So a professional wants to have a higher than normal salary. Maybe more precisely, the professional actually wants a salary that grows faster than anyone else's salary. This way he will be accumulating a larger portion of the stuff available. There are many ways they can accomplish this.

The labor market can be expressed as a simple set of supply and demand curves. Inside this market, the consumers who generate the demand curve are actually the companies that wish to hire new employees. The suppliers that make up the supply curve are actually the workers. They are the ones that are offering themselves up for labor. These curves intersect somewhere at an equilibrium and that is the salary that is agreed upon inside that labor market. Some laborers will not work for that salary and remain unemployed.

In the case of professional regulations through private interests, the professionals already working in the field can actually affect the supply of new laborers. One way they can do this is through some manner of examination. If someone has to pass an examination before they can work in this certain profession, and the examination is very difficult, it is likely that many candidates will not pass. Since these candidates are being turned away, there will be a shortage in the supply of new professionals inside the field.

If the supply of laborers is decreased, then using simple supply and demand, it is easy to see that the new equilibrium salary will be increased. Through the administration of an examination, the professionals inside the field have managed to increase their own salary. It would be like stifling your competition before they ever got a chance to compete. From a simple supply and demand model, it can be seen that in addition to increasing wages, the level of employment will be smaller than usual as well. If a profession has an entry examination, it is likely that the number of professionals is lower than it would otherwise be.

If the companies have to pay these higher salaries to these professionals, then they will just pass on some their higher costs to their customers. If the customers actually realized what was going on, they would be outraged. It is actually very unlikely they will ever notice for a couple reasons though. First, most regulated professions are very small. At the same time, their customer base can be extremely large. Almost all Americans have some form of insurance, but there are a very small number of actuaries who price it. The public as a whole is ignorant of the situation because the increase in cost to them as a whole is very small. It would be like each and every American paying one extra penny per day to the pocket of some unknown person sitting somewhere they cannot see. It is unlikely they will realize they are even being charged for the costs of the professionals' educations, and yet the person in the dark office is getting rich very quickly.

It is important to note that any form of barrier to entry on a profession will create this income effect. It is entirely possible that these groups of professionals are taking money from the public completely inadvertently. They think there are real reasons they should be regulating their new professionals. Some of these professionals could have only the best intentions in mind.

That would not change the results of their actions though. Barriers to entry such as examinations still have a very good chance of driving up prices and salaries.

Another problem would be overtraining of professionals. If the examinations are really a lot tougher than they need to be just to limit competition, you could be overtraining the incoming employees. If the professional has invested so much of his time into becoming a master of his field just to pass the examinations, then any work assigned to him or her that is on a lower level than he or she is trained for would be a waste of money. At the same time, the work they are doing must be done by someone that has passed the examinations due to licensing restrictions.

For example, with actuarial examinations students are often working while they take the examinations. The company they work for gives them needed supplies and more importantly time at work to study for these examinations. This is time at work that the company is just giving to these students. With the supply of actuaries being choked though, the companies have to give study time at work to attract the diminished supply of actuarial students that remain. They are losing money while the students are studying. To make up for the lost money, the companies again charge their customers higher prices. This might be justifiable if the studying led to a greatly increased productivity in the student in years to come. If the student is being tested on more than he needs to know to perform his job though, then these higher prices are being charged for no reason. Thus they are wasting the public's money.

These are some of the reasons professional examinations exist, as well as some of the problems inherent in them. Next, I will explore some of the details surrounding the chosen professional examinations.

III. Entry Barriers

A. Types of Entry Barriers

There are many kinds of barriers to entry in professions. In a capitalist society, everyone is out to get ahead. For example, some professions, like children's dance teachers, require for you to start your own business to practice the profession. An entry barrier that can easily arise here is difficulty in obtaining banking credit for a business loan. Many specific business loans are only given out by a select number of banks to only the best applicants. Nicola Cetorelli and Philip Strahan study how this lack of competition in banking can even effect non-banking professions (Cetorelli 2004). For a look at how limited bank competition can erect entry barriers in fledgling economies, Cevdet Denizer has studied the effects limited loan able funds has had in Turkey (Denizer 1999).

Many times the government steps in and helps erect entry barriers. One way they do this is by giving out patents. If one business has a patent on a product they can explicitly close down any competition that arises. Drug companies are a classic case of this. A recent article by Henry Grabowski and John Vernon explores the effects a recent law has had on easing entry barriers for generic drugs (Grabowski 1995). Patents need to be renewed if possible though, and sometimes copycat businesses will keep a close eye on a patent holder when the renewal time is near. For the patent holder, it then becomes difficult to tell if it is worthwhile to renew the patent when they feel they already have claimed all of their profit they feel they can attain. A game of cat and mouse arises and is explored in an article by Corrine Langinier (Langinier 2004).

Government regulation can have many complications with its construction and execution. The government can not be a completely impartial group who makes decisions just to protect the consumer. There will always be special interest groups applying pressure, along with many other sources. Antonio Estache and David Martimort study some of the options to building the governmental regulating bodies. They explain that although professional experts would be very knowledgeable in their field, they would also be likely to return to practice, and thus wish to preserve the profession's income for when they return. They conclude that elected public officials would be unlikely to be any better since they will still face pressure from outside sources, and they will not even understand the profession they are regulating enough to see the consequences of their choices (Estache 1999). There are many problems with government regulation, but they are not the only group that can enforce entry barriers.

Companies that have monopolies in multiple markets can exercise some unique entry barriers. Bundling their products together is one entry barrier often overlooked. Proctor and Gamble is a huge household goods producer that can offer discount for buying toothbrushes and hand soap together. Barry Nalebuff explored many of the repercussions of using bundling as a barrier to entry. One of his insightful findings was that even though consumers benefit from the reduced price for the bundle, they are hurt much more by the stifling of competition. The companies are making great economic profit with their entry deterrent (Nalebuff 2004). Another study by Richard Gilbert and Carmen Matutes focuses on how multiproduct companies try to stifle competition by brand proliferation (Gilbert 1990).

B. Examinations as Entry Barriers

For many professions, entry barriers take the form of professional licensing. Morris Kleiner and Robert Kudrle explore the effects licensing has on the dentist profession in the United States. They explore the impact different state requirements have on the number of new professionals in each state. In their results, they claim to have evidence that stricter licensing provisions in a state deter new dentists from working in that state (Kleiner 1992).

Johnathon Guryan and Joshua Angrist did a study on how forcing public school teachers to pass state administered entry examinations affected the salary of public school teachers and the quality of public school teachers. They proposed that as an entry barrier, the testing would raise salaries, but also affect the quality of teachers. They felt that the tests would eliminate those under qualified to teach, but would also cause some of the best qualified teachers to go to private schools where they would not be bothered by the examinations. Therefore, they felt that although the salaries would go up, the quality of teachers would remain about the same. Their findings seem to support their claims (Angrist 2003).

There have been other studies that focused on relating incomes to admittance rates when professional examinations were involved. Bernardo Bortolotti and Gianluca Fiorentini did an extensive study of Italian accountants. First they compared the accounting profession to two other professions in Italy to show how it used examinations as barriers to entry. Then they used data to show the effects self regulation has on the existing accountants' behavior. They found evidence that admittance rates were actually

based on prior income levels, implying that the existing accountants tried to boost their lagging incomes by choking competition (Bortolotti 1997).

Another article by John Hood shows how entry barriers can ultimately hurt consumers. Many other people only concentrate on the effects on professionals in the industry. John Hood explains what happens to the end product consumers. He explores how these entry barriers can be intended to actually protect the consumer. In the end though, he concludes by showing the effects to consumers in the areas of both prices and quality (Hood 1992).

An all encompassing article on barriers to entry was written by Nuno Garoupa. He studied entry barriers on lawyers and physicians across almost all of western civilization. He starts by explaining why the barriers exist, and then goes into detail about how they were enforced. It is interesting to see how different kinds of groups emerge to enforce these barrier entries. I am focusing on private interests, but these private groups can often hide under the wing of an ignorant government. From here, he talks about the different distinct types of barriers to entry and how these affect his chosen professions. One idea in particular I used from Garoupa was the hypothesis that if a profession is being restricted by entry barriers, then it should have a comparatively low level of unemployment. Garoupa went on to test his theories, and in particular tried to analyze government law in his chosen regions. He concluded that the United States, Norway, the United Kingdom and Belgium provide efficient regulation, while Germany, Austria and Portugal perform badly for both legal and medical professions (Garoupa 2004).

IV. Examinations

A. Actuarial Examinations

Three examinations in particular are going to be studied: the actuarial exams, the Multistate Bar Examination and the Certified Public Accountant examinations. All of these exams have similarities and differences, but each one serves as an entry barrier for its profession. It is very difficult to practice in any of these professions without passing these entrance examinations first.

The first to be explored will be the actuarial exams. These exams are given jointly by the Society of Actuaries, also known as the SOA, and the Casualty Actuarial Society, also known as the CAS, inside of the United States. The actual exam structure does change every four years on average, but many aspects of the exam stay the same. There are a series of five to ten examinations that are given usually once or twice per year. The content generally does not vary greatly when the exam structure is changed. The first half of the examinations the SOA and the CAS give jointly and test the same material. In the later examinations, the SOA tests detail health and life insurance topics while the CAS concentrates on auto, or general property and casualty insurance.

Most of the examinations are forty multiple choice questions. Some of the later exams take the form of a seminar or more written work. The scoring of these exams could be considered very peculiar to an outsider. When a candidate is given back his score, he is given a number from one to ten. Any number from six and above means he passed, and anything five or less means he failed.

The oddest characteristic of the scoring is that for the multiple choice exams, the number of correct answers to attain a score of six, a passing score, varies from year to year. One year it may mean you need to answer 36 correct to pass, and the next only 30. The examination committee that determines the score explains their reasoning. They explore each question and determine how applicable it was and how necessary it be that the candidate answers it correctly. This way they can score each question individually and then try and set a level to which they want to hold the candidates. With this reasoning, it is easy to see why the passing ratios fluctuate from year to year for these exams. It makes it at least appear to the candidates though that they are competing with each other. If the candidates never know what the pass ratio is or how each question is weighted, then it really drives home a need to get in the highest percentiles and out score all of the competition. This can lead to students studying every obscure fact, hoping it will be asked and they can answer it, giving them a slim edge over the competition.

If the examination committee is honest in their reasoning behind scoring the examinations, then it is doubtful that they consciously control the supply of new actuaries to affect their incomes. It is entirely possible that they do this inadvertently though. If they do not pass many candidates for awhile, it is likely their own incomes will rise as a result. If this occurs, then it easily shows how damaging the examination is as an entry barrier to consumers. The consumers are going to be the ones that have to pay the higher salaries.

Also, it has often been argued that these exams test more knowledge than is needed to perform the duties of an actuary. It is also true that companies that employ actuaries often give their students paid time at work to study. This means that if these

students are studying useless knowledge on company hours, then the company is going to lose money. To make up the money, they will pass some of the cost onto their customers. This is another way the consumers will be hurt.

B. CPA Examinations

The next professional examination is the Certified Public Accountant examination. It is a very standardized test given to anyone that wants to become a professional accountant. The exam is available to be taken two months every season. Therefore, there are many opportunities to sit for this examination. There are four parts to it, and they may be taken all at once or at separate sittings as long as they are completed in a timely manner. Once you pass all of these exams you are then able to sign your name to many taxation calculations and general bookkeeping ledges as a Certified Public Accountant.

The most interesting development with the CPA exam is its recent transformation to a computer based testing system. It is the first professional examination examined to have done this. The CPA exam did this for many reasons. First, they did it so that the testing would more closely resemble the work a real accountant would do. They use the computer to simulate real accounting software and problems during the examination. It also forces all new accountants to have at least some computer familiarity. Before this, some accountants were qualified with a CPA exam, but incapable of working due to computer incompetence.

The greatest advancement with the computer based testing is the inclusion of adaptive features. The computer system stores a vast array of possible questions. It

groups these into small sets of twenty questions with a consistent difficulty level. This means it has many sets of easy questions, medium questions, hard questions, and blended sets in-between. Each candidate begins the exam with a set of moderate difficulty questions. Depending on their performance on these questions, the next set offered to them may be more difficult or easier than their prior set. This continues with the next set and helps narrow down the candidate's true capabilities.

These adaptive features are only available on a computer based system since you have to have the immediate results of the first question set to decide what questions to give next. This gives a much more accurate score for the candidate than the traditional one set of questions. The exam committee that used to have to worry about scoring the exam as a whole, now just needs to continually audit their question pool and keep appropriate questions in each of the question pools.

C. BAR Examinations

The last professional examination is the Multi-State Bar Examination. This is the most common examination given to aspiring lawyers before there are allowed to practice law inside the United States. This examination is unique in the manner it is administrated and scored. There is a central, national body that both administrates the bar examination and then calculates an adjusted score for every candidate. The adjusted scores are all just normalized raw scores so that the adjusted scores will be comparable from year to year. This is very similar to what the Society of Actuaries does, in that neither really releases a raw score. It would seem that both examinations could be skewed by an exceptionally smart or dumb set of candidates in a particular year. Also, it would seem that it would be

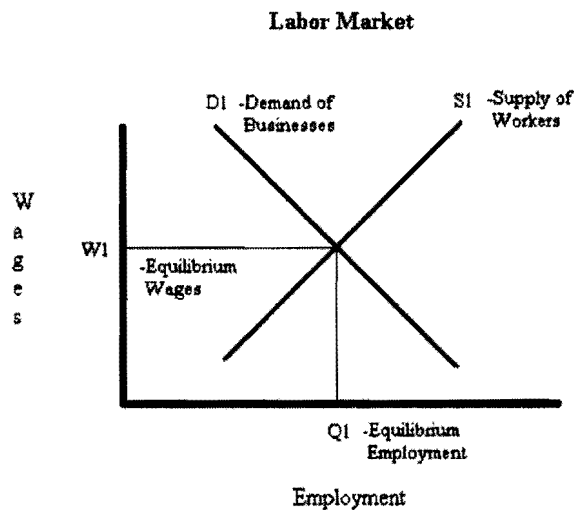
easy to adjust the reported scores for the committee's own purposes without drawing attention to it.

A big difference between the bar examination and the others comes with how the scores are treated. Even though there is a national board that sets the scores, each individual state that decides to use the bar examination then sets their own passing scores. They all do it by different means, and not all of these are released. Some of the just set a given passing score, and others just set a given passing rate. There is a wide variety in the way these national scores are handled by the individual states.

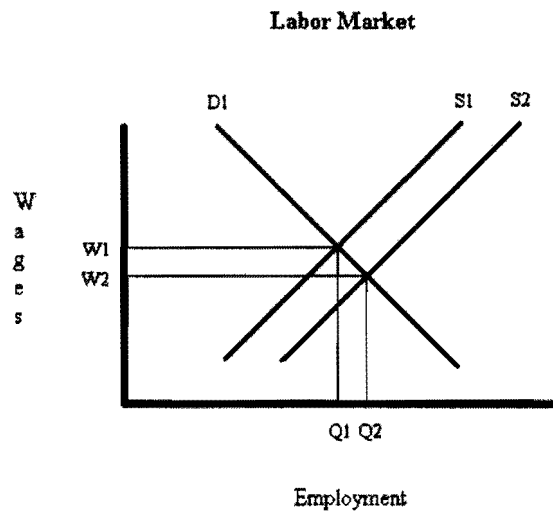
V. Hypothesis

A. Model Used

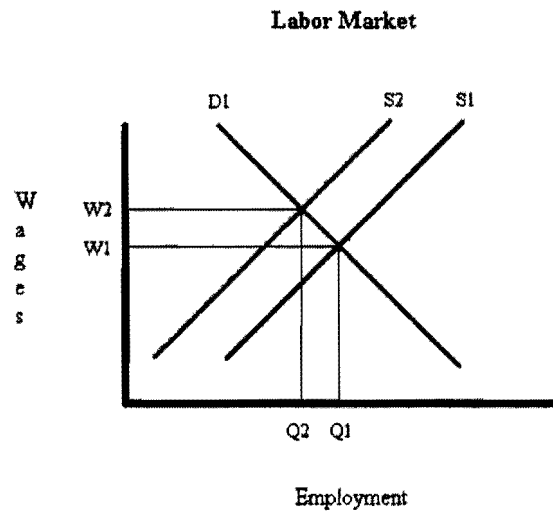
For the hypotheses, a simple supply and demand model of labor will be used. Relationships will be hypothesized, and then they will be tested by choosing indicators to look for in real data. The labor market model will just be a simple one, lacking expectations and delays of price realization. The horizontal axis will represent the quantity of laborers employed, and the vertical axis will represent the income level of these laborers. There will only be a supply curve, formed by the aspiring students looking to enter each of these professions, and a demand curve, formed by the businesses looking for new hires.



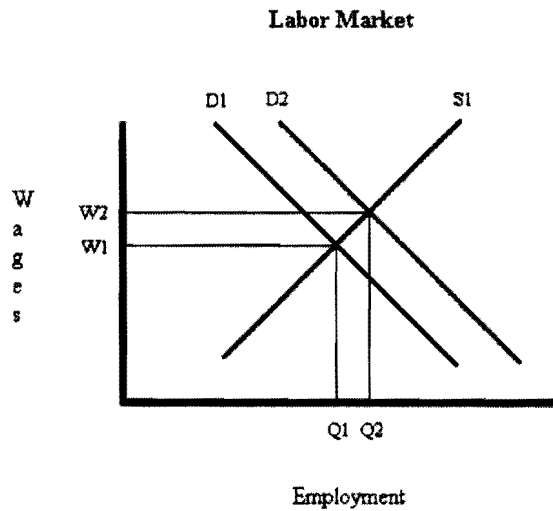
If the supply of new students expands, then quantity of employment will rise and incomes will fall.



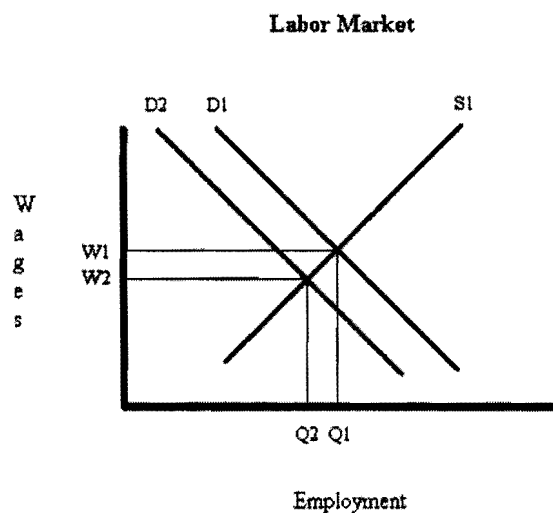
If the supply recedes, then the quantity will fall and income will rise.



If the demand for students expands, then both income and employment quantity will rise.



If the demand for students recedes, then both income and employment quantity will fall.



For a more detailed explanation of modern labor market models a good book to read would be *Labor Economics* by George J. Borjas.

B. Relationships Explored

There are many ways these professional examinations will affect this model. The people who control these examinations are best represented by the current supply of professionals already working in their respective field. These established professionals have their own interests driving them, the primary of which in a capitalist society is to maximize income. They would want to see the supply of professionals shrink, or at least grow less rapidly than it would otherwise. This would drive their income growth up.

These professional examinations serve as a barrier to entry. Inside the model, they serve to limit the supply of professionals. In limiting supply, they should lower the quantity of employed professionals and raise their incomes. To be technical, they should lower the growth of quantity and raise their income growth. The more limiting the examination, via a lower passing rate, the larger the effect on the supply curve should be. This relationship will be tested by collecting data and then comparing changes in pass rates to future changes in incomes. If this is really occurring, then when a professional examination is significantly harder one year than the prior causing a pass rate decline, then employed professionals' incomes should rise faster than usual in the near future.

In the above relationship, pass rates affected future incomes. There could be a reverse causation though. Since the ruling bodies of these examinations are employed professionals, they could try and control their own future incomes by controlling their own supply curve. A lower than average income growth would prompt them to hold back the supply curve by lowering the pass ratio in the near future. This would be a result of the current professionals trying to boost their future incomes at the expense of the aspiring candidates. They would be purposefully shrinking back the supply curve.

The same data will be used for this test, but will be explored for a time lag in the other direction and reverse causation from before.

The last relationship is just a more general test to see how large of an impact professional examinations have on these professions as a whole. This will be done to try and see if they actually affect employment growth just by existing. To test this, employment numbers from inside each profession will be obtained and then compared to general employment numbers of closely related professions. It would seem logical that closely related professions, such as lawyers and paralegals, should have a very similar growth in employment over time. If the lawyers are lagging behind in their growth, then it would signify that the professional examinations are having a large impact on the individual professions.

VI. Data

A. Pass Rate Data

The first data obtained was the examination pass rate data. The BAR exam data turned out to be extremely easy to acquire. It maintains a nice website with information on the examination and easy links leading to downloadable documents containing the data. They had data as far back as the 1980's and all of it was split up by state and year. This afforded me a great many data points for the bar exam pass rates.

The next data was the pass rate data from the Society of Actuaries. They do have a flashy website, but it is rather unhelpful. The website only listed the last two years total pass rates. The available Society of Actuaries data did not extend back any further. Luckily, there is also the Casualty Actuarial Society. This is a sister society that shares the same first four exams as the Society of Actuaries. The CAS has fewer total members, but they still have a much better database of passing scores. They also gave data back into the 1980's. Since the bulk of actuarial candidates are sitting for the first four exams every time, the data from the CAS should give a good representation of the pass rates as a whole. In fact, in the past five years, over 90% of the CAS candidates each year have been sitting for one of the first four exams that are shared by the CAS and SOA. Only 10% or less of the pass rates will be any different between the societies. This should make credible data to use for actuarial pass rates in general.

Shared Actuarial Exams	
Years	2000-2004
Shared Exam Takers	97,037
CAS Only Exam Takers	9,111
Percentage Shared	91.42%

The last pass rate data was for the CPA exam. This turned out to be a very difficult process. They seem to be released only in a highly professional report that is then sold for a large amount of money to research institutions that deems it worthy to pay for them. Ball State only has a couple of these scattered through the years, so this was a very bad source of data. Attempts to contact the national organization that administers the CPA exam were met with no success. In the end, getting into contact with the professional licensing branch at the state capital in Indianapolis was the best approach. They had Indiana's passing rates leading back into the 1980's and they were willing to make copies of the data. A trip was made to the capital and the photocopies were obtained. At that point, it did not seem worthwhile to attempt to go to other state capitals and try and get similar pass rates from them. So for the CPA exam, only Indiana pass rate data was used.

After the pass rate data was obtained, it was then processed into time series for each examination. The pass rate for each year was calculated to be the number of passing scores in that year divided by the number of examinations attempted. Then the logarithmic growth rates during each year were calculated. The end data for the actuaries and lawyers was at a national level and only Indiana data for the accountants.

B. Employment and Income Data

The last source of data turned out to be very bountiful. The Bureau of Labor Statistics turned out to have very extensive sources of data for both incomes and employment numbers. For most professions imaginable, they have both annual salary and employment numbers for all fifty states dating back to 1998. In addition, they even break the professional job market down into sectors, and then release the totals for each of these sectors. Lawyers fell under legal professions. Actuaries fell under mathematical computer related professions. Accountants fell under the financial markets sector. Using these broader sectors, sector growths relating to each of my individual professions was obtained.

This data was also turned into time series composed of logarithmic growth rates for each individual profession and sector. This gave three time series for income and two sets of three times series for employment numbers. For the income numbers, national data for actuaries and lawyers and Indiana data for the accountants was used to match the pass rate data.

On the whole, the data acquired was highly credible and accurate. It would have been nice to be able to acquire a state breakdown on the actuarial exams. It seems there might just not be a sufficient number of people taking the actuarial examinations to really mandate that sort of detail in their reporting. It also would have been nice if there was an easier way to obtain the CPA results for each of the states. The accounting boards seemed to be quite closed lipped about their results in the end. The fact they make a profit off of selling their results might make a difference in that matter. Lastly, the

Bureau of Labor Statistics data was a great source, if only a little lacking on the numbers of years available.

VI. Test Results

A. Income Rates versus Passing Rates

Two of the relationships involved comparing income growth rates versus passing rates. The test were done to see which caused which, or if they were unrelated. For this causation test, both variables were tested on a zero, one, and then two year delay to each other to see which relationship was the strongest. The right direction of causation was also checked for. If income growth rates affected future passing rates, there should be a positive relationship. If passing rates affected future income growth rates, there should be a negative relationship.

First, the strongest results came from the actuarial examination tests. A very strong relationship between the change in pass rates and the change in incomes two years in the future was discovered. It was a negative relationship, as predicted, and the statistics were very significant. The only flaw is that there were only four data points in the end because of all the data processing required to create the coordinates tested. Only four data points means the results has less credibility, but the statistical significance of the results helps to balance this.

CAS Pass Rates (x) Causing Income Growth Rates (y)	
National Level	2 Year Delay
N	4
R ²	0.9445
P-value	0.0282
Result	$y = .0359 - .1763x$

The next strongest relationships were the results from the CPA examination tests. An equal amount of data as above was used for this examination because only Indiana state level passing rates were acquired. After testing all the relationships between the changes in CPA pass rates and the change in accountants' incomes in Indiana, a similar conclusion as above was reached, but this one was not as mathematically sound. The relationship remained the same, a two year delay between the passing rates causing a change in income with a negative relationship. With this data set though, the statistical credibility of the results were negligible. Yet, of the tested relationships between these two time series, this was the strongest by far. These results would be meaningless on their own though.

CPA Pass Rates (x) Causing Income Growth Rates (y)	
Indiana State Level	2 Year Delay
N	4
R ²	0.4312
P-value	0.3434
Result	$y = .0399 - .0499x$

The last of the pass rate data was the Bar rate data. With this data, there was a much larger set of data points because state level data for both the pass rates and the incomes was available. This data was used to make large cross panel time series with many data points. Unfortunately, it did no good because there only trivial relationships were discovered. The best relationship was a small bit of reverse causation; the change in income seemed to be driving the change in the pass rates one year in the future. Not only

was the relationship weak, but it was also in the wrong direction according to my hypothesis.

Lawyer Income Rates (x) Causing BAR Pass Rates (y)	
State Level	1 Year Delay
N	248
R ²	0.0428
P-value	0.0010
Result	$y = .0154 - .1949x$

These same tests could have been done on each of the fifty states individually, but that is statistically unwise to do. If a particular relationship is being sought in a large data set broken down into smaller sets, it becomes very likely that the relationship will appear out of sheer randomness. Put another way, if it is assumed all the data for all the states was completely unrelated and random then there is still a good chance any relationship that is sought after will appear in one of the states. Even supporting results were found, they would be easily discredited.

B. Individual Profession versus Sector Growth Rates

With all of these data sets, a nice large sample size was used due to the extensiveness of the Bureau of Labor Statistics data. Again a cross sector time series that included data for all of the states was made. The professional sector data was already subdivided and was also made into a time series. Unfortunately, these results did not support the hypothesis of professional examinations choking employment growth relative to general sector growth.

First, the accountants were the only profession to grow at any rate less than their similar professions. Even then, their growth rate was still very close to their sector's growth rate.

Accounting Growth to General Financial Growth	
N	269
Avg Accounting	2.53%
Avg Financial	2.98%

The lawyers were very close to everyone else in their sector as well. Unlike the accountants though, their growth rate was slightly larger than the growth rate of other legal professions.

Lawyer Growth to General Legal Growth	
N	254
Avg Lawyer	2.74%
Avg Legal	2.44%

The last profession was the actuarial profession compared to other mathematics jobs involving computers. This relationship turned out to be completely opposite than expected. The average employment growth of actuaries is much larger than anyone else in their sector.

Actuarial Growth to General Mathematics Growth	
N	143
Avg Actuarial	3.95%
Avg Mathematical	1.52%

C. Other Results

The only other trend that stood enough to get noticed had to do with the computerized CPA examination. The computerized CPA examinations have only been given during 2004. As discussed before, they added many attractive improvements to try and increase its accuracy and applicability. Unfortunately, it appears that aspiring accountants in Indiana are horrible at computerized examinations. The results for 2004 are below.

Computerized CPA Exams	
Year	2004
Taken	1459
Passed	123
Rate	8.43%

To give something to compare these results against, here are the aggregate results for all of the pencil and paper examinations.

Paper and Pencil CPA Exams	
Years	1998-2003
Taken	11411
Passed	2062
Rate	18.07%

For the mathematical analysts out there, the pencil and paper results really did not vary much from year to year. In fact, 1999 had the lowest results of any year, and they were still no where near as bad as the one year of computerized testing.

Lowest Pencil and Paper Results	
Year	1999
Taken	3087
Passed	438
Rate	14.19%

It is easy to see that the one year of computerized examinations resulted in a much lower pass rate than would ever be expected given the years of pencil and paper exams.

VII. Conclusion

A. Income Rates versus Passing Rates

After looking at the results of the analysis, it appears passing rates affect income rates. In none of the professions was there any proof that income rates caused changes in passing rates. This means it seems unlikely that the examination boards are tightening up pass rates when they feel that their incomes growth is lower than it was the previous year. On the other hand though, there was some very strong proof that the examinations were acting as strong entry barriers in some of the professions.

In particular, the Society of Actuaries seems to be directly affecting their own income growth by their choice of pass rates. If anyone on the board realized the extreme control they had over their own income growth, then there would be a great moral hazard to at least smooth out their income growth, or just make it skyrocket for the few years until they retire. On the other hand, the members could realize what power they have, but are outstanding public citizens who are satisfied with what they have and are only worried about the quality of actuaries they produce. Even if this were the case though, it would seem that they are over tightening their quality control since they are so strongly affecting the supply of new actuaries.

For the CPA examination, the results were mathematically insignificant. It is interesting to note that the strongest of the insignificant trends was exactly the same as the trend for the actuarial examination. It was the same relationship that said increases in passing rates cause decreases in income growth two years later. This seems to at least add a little more credibility to the actuarial results since the same relationship surfaced in

both cases. It was interesting to find no mathematically significant relationship between the CPA exam pass rates and accountants' incomes though. With pass rates so low at times, it would seem that the professional examinations would have to have some impact on the labor market. There just might be some other factor that has an even larger impact and covers up any effect the pass rates might have had.

The other interesting results from studying the CPA examination data was not the regression results, but the manner in which the data had to be obtained. The examination board seems to keep a tight reign on their results. In fact, they seem to be trying to make a profit off of the results. It does beg the question of are they actually trying to profit from the results, or are they just trying to keep their students in the dark as to how effective the examination is as an entry barrier.

The last examination was the BAR examination. No relationship between the income growth rates and the passing rates seemed to exist. The unique structure of this examination was likely the main cause of the inconclusive results. Even though there is a singular national examination committee that sets the scores, it is up to each individual state licensing office to choose what they will accept as a passing score. The results could have been inconclusive because not all of the state offices act in similar manner. There are probably highly credible offices that just set a certain passing score, others that set a passing rate, and others who are actually going after their own income growth. Those that just set passing scores seem to be the most credible they seem to be actually concerned about the quality of candidate. The others that set a given pass rate are obviously using the examination as a pure barrier to entry. These people only want to let a certain percentage in to the profession, no matter how large the field is. It is just very

difficult to identify the other's motives since there are so many states out there that do not set passing rates or scores.

It does appear from these results that at least the actuarial examinations serve as effective entry barriers. The CPA examinations do not seem to have a strong effect on accountants' incomes. The BAR examination seems to have different effects depending on the state looked at. In none of the data was there any proof that the examination committees based the pass rates on their own income growth.

B. Individual Profession versus Sector Growth Results

The hypothesis on employment growth choking appears to have been disproved. The hypothesis was that employment growth in related professions should be similar, but those with entry barriers should be lower than the others. None of the professions examined seem to be lagging behind the rest of their professional sector in terms of employment growth. It seems that these results claim that examinations as entry barriers do not have a strong effect on relative employment growth. After looking at the results, it could instead be hypothesized that the relative growth rate differential is due more to job desirability. Here could be an explanation for the result using this rationalization.

The lawyers seemed to be growing at an equal rate with all the other legal professions. This could be because younger people see being a lawyer and being a paralegal as equally desirable. A lawyer may make more money, but the costs in terms of time and study make other options equally desirable.

The accountants were the only profession to lag behind their other financial sector growth rates. The lack of desirability could be blamed on social views and possible

misconceptions about accountants. Hollywood in particular really portrays it as an undesirable job. At the same time, other similar jobs such as stock traders and financial advisors in particular have seemed to get a recent push. This would indicate that being an accountant is less desirable than other financial jobs.

The actuaries showed an above average growth rate compared to other mathematical computer jobs. This can be explained easily by the recent inclusion of actuary into many top job lists in the recent years. It tends to make the top of the lists due to the income level, job reliability, and low stress level. It is true many people still have no idea of what an actuary is, but those same people also would not know what the other jobs were that involved mathematics. Of those people interested in a mathematical computer based job, being an actuary is easily one of the most desirable jobs.

This is the only possible reason the growth rates related the way they did. It is just a plausible relationship that supports the data examined. It is generally a bad idea to find relationships and then try and explain them though, so the above desirability argument should be seen solely as a new hypothesis. The old hypothesis on employment growth choking was still disproved.

C. Other Results

The last thing to discuss is the horrible pass rates Hoosiers experienced on the computerized CPA examination. It is very easy to see that the pass rates were unusually low in all of 2004, the first year the computerized examinations were used. There are a couple possible explanations for this. It is important to remember that the pass rates are

nationally controlled with the CPA examination, unlike the BAR that has a state level component.

First, it could be that the whole nation was given an unusually low pass rate for the first year of the computerized examination. If this was the case, it could mean the examination committee has decided to really tighten up and use the examination as an entry barrier. They could have multiple reasons to do so. The first one hypothesized before is that they are trying to increase their own incomes. The other more benign reason would be that they feel the results were actually that bad and that aspiring accountants just did not have the computer skills they needed. This could be caused by a national trend of bad teaching. The last could just be that the students were not used to the computerized examination. This seems unlikely though since they have had three times to sit for it in 2004 already, and the scores have not significantly risen. Regardless of the actual cause, if any of the above were true it would mean it was a national trend.

The other option would be that only Indiana in particular scored so badly on the computerized examination. The national committee could have kept the national passing rate or passing score the same. If this were the case, it would mean that Hoosiers are substantially behind most of the other states with their computer skills. This seems equally likely, but both seem equally hard to prove. Whether the low scores were a national trend or just local to Indiana, it would take data from a large number of states to try and prove either case. This brings back up the suspicion that the CPA examination committee likes the idea of hiding the results from the public. Whatever the cause, it is still interesting to note how low the pass rates were for the computerized CPA examination in Indiana.

D. Future Research

There are multiple directions future research could take in regards to this topic. First, there are ways the tests done here could be repeated with different data. One of the ways the causation tests could be done again is by comparing the pass rates to either an altered income data set or maybe an employment growth data set. For an altered income growth set, it might be favorable to calculate some measure of average growth and then remove that value from the income growth used in this research. This might give a better idea of when one year's income growth was actually better or worse than another year's. It would add a sense of relativity to the data. Some examples of measurements of average growth could be change in GDP, general inflation, or just the average income growth for each profession.

Another, more data rich option might be to try and break down the state data for the BAR examinations. Instead of looking at each state individually, it could be rewarding to try and group the states together based on how they choose to pass candidates. The groups could consist of states that passed candidates based on their actual score, ones that passed the same percentage of candidates each year, and the others that do not show a discernable pattern. All the same tests as before could be ran on each group of states.

E. Closing

In closing, I feel that I fully explored the hypotheses I set out to test. I know I at least proved that the actuarial examinations are serving as strong entry barriers.

However, I did not prove that the examination committees were controlling their own income. The BAR examination was just too subdivided to give any solid results. The employment growth relationships did not pan out as I predicted. I was unable to use those results to add further evidence that the professional examinations were solid entry barriers.

In the end, I feel much more knowledgeable about the subject. I especially like knowing that there do not seem to be evil examination committees out there striving to control their own incomes. I still do not like that some of the examinations seem to be such efficient entry barriers. Above all else though, I hope to just spread the facts I found and get other people interested in the subject.

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